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ABSTRACT

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Working Paper No. 83

Three Dimensions of the Cognitive Function of Speech: Papers Presented at the 57th Annual Meeting of the Speech Communication Association

By Larry Wilder

Report from the Project on Letter-Sound Relationships and the Development of Reading Skills

Larry Wilder, Principal Investigator

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

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The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Working Paper is from the Project on Variables and Processes in Cognitive Learning in Program 1, Conditions and Processes of Learning. General objectives of the Program are to generate knowledge and develop general taxonomies, models, or theories of cognitive learning, and to utilize the knowledge in the development of curriculum materials and procedures. Contributing to these Program objectives, this project has three objectives: to ascertain the important variables in cognitive learning and to apply relevant knowledge to the development of instructional materials and to the programming of instruction for individual students; to clarify the basic processes and abilities involved in concept learning; and to develop a system of individually guided motivation for use in the elementary school.

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ABSTRACT

These papers were presented at the 57th Annual Meeting of the Speech Communication Association in San Francisco, December 27-30, 1971. "Perspectives on Research in Speech and Cognitive Processes" was presented to a panel a session on "Speech Communication Research of the '70s: Six Priority Areas," sponsored by the Research Board of SCA. It reviews the past and current research on the cognitive function of speech. "Speech as Communication and Verbal Behavior" was read to a Dimension Series panel on "The Centrality of the Spoken Word," and it is concerned with speech as a unique response modality in human communication and verbal behavior. "Speech Processes and Cognitive Learning in Young Children," was presented to the Educational Policies Board program on "Speech in the Classroom: A Digest of Information on Oral Language Development for the Classroom Teacher," and it reviews the theory and pedagogical implications of the cognitive function of speech in young children.

I. PERSPECTIVES ON RESEARCH IN SPEECH AND COGNITIVE PROCESSES

Traditionally, the speech field has studied variables associated with the effects of a message sent from a source to a receiver(s). The effects of this speech communication may be on the sender, the receiver, or both. The emphasis on the communicative aspects of speech points out its most basic function: the coordination (or control) of human activity. However, nonspeech behaviors also coordinate human activity; consequently, the research literature in speech communication testifies to a greater concern for communication than for speech. It seems that speech is not so highly thought of in most speech communication circles.

Notable exceptions to this trend in speech communication research are evidenced in studies pertaining to language and speech phenomena. However, it is often unclear what special theoretical perspective the speech communication researcher brings to bear on such phenomena. Although concern for theoretical autonomy reeks of the "wither speech" literature of the past, such concern is essential to the development of reliable research and firm theoretical bases.

We need to broaden our concept of "speech science" to include research pertaining to more than the physiological, linguistic, and communicative aspects of speech. To use Hymes's terms, we must establish an ethnography of speaking: "The ethnography of speaking is concerned with the situations and uses, the patterns and functions, of speaking as an activity in its own right" (1962, p. 16). This paper is concerned with theory and research relevant to one aspect of such an ethnography: speech and cognitive processes.

Background

As used here, the term "cognitive process" refers to a means by which stimuli are represented or organized within the individual. The cognitive viewpoint stresses that perception cannot be divorced from the person doing the perceiving. As Neisser has stated it (1967, p. 3):

> There certainly is a real world of trees and people and cars and even books, and it has a great deal to do with our experiences of these objects. However, we have no direct, immediate access to the world, nor to any of its properties. The ancient theory of eidola, which supposed that faint copies of objects can enter the mind directly, must be rejected. Whatever we know about reality has been mediated, not only by the organs of sense but by complex systems which interpret and reinterpret sensory information. The activity of the cognitive systems results in--and is integrated with--the activity of muscles and glands that we call "behavior."

According to Neisser, humans impose structure upon what they experience. The behavior which results from our experiences tends to interact with these internal structures. Cognition, then, cannot be divorced from behavior.

Speech is a uniquely human behavior, yet its cognitive function has received little attention. While speech scholars tend to concentrate on its communicative function, the tendency in psychology is to regard it as any other behavior. Thus, while more complicated than the eyeblink, it is essentially the same. As Osgood (1952) has put it, the speech act is "complicated to be sure, but not different from tying one's shoes" (p. 157). In light of Osgood's opinion, one wonders why there have been so many books written about speech and man and so few devoted to eyeblink and man.

Noam Chomsky (1959) has challenged the behaviorist interpretation of verbal behavior. However, in rejecting behaviorism Chomsky has become too divorced from behavior. Consequently, his theory of the structure of language ignores the human speaking it and becomes needlessly abstract. Liberman has recently criticized such theorizing (1970, p. 301):

> In the conventional wisdom, consonants and vowels are not so highly though of. To the linguist, these elements serve primarily as a concrete base for abstract concepts. The psychologist seems to find them even less interesting. To him, the sounds of speech are no more than convenient vehicles, much like the letters of the alphabet. They carry linguistic information, but their connection to language does not appear to be organic; they are, therefore, not usually thought to have much to do with psycholinguistics. According to these fairly common views, then, language and its psychology are to be found only at the higher levels; there they enjoy an unspeakably abstract existence, forever safe from the rude interventions of the experimental scientist.

Theoretical arguments are not easily resolved, and one should not hastily conclude that Chomsky successfully discredited the behaviorist position, nor that Liberman has demonstrated that the psycholinguistic approach is untenable. We must conclude, at this point at least, that humans are exceedingly complex organisms, and that a general theory of behavior does not account for language; further, it would appear that language theories are deficient with respect to speech behavior. What follows is a review of the early and current concern for the role of speech in cognitive processes.

Early Speculation

One of the earliest and most well-known accounts of the cognitive function of speech was Watson's notion of thought as subvocal

muscular movement. Compelled by the doctrine of behaviorism, which demanded that all mental events be explained by observable events, Watson inferred causal relationships from the early physiological evidence which correlated certain kinds of thought with with movement of the larynx. Although Watson's theory of thought was far broader than subvocal speech, his critics oversimplified and strongly reacted to his position. Comments like "I don't know whether I believe Watson or not; I have yet to make up my larynx on the matter" were not uncommon.

In many ways the reaction against Watson was unfortunate, since it led to a number of "crucial experiments," which involved the suppression of vocal movement by various means to see if subjects could still think or learn. These experiments ranged from freezing the larynx to suppressing articulation, and they were highly oversimplified tests of subvocal speech.

During this same period, Grace Andrus de Laguna (1927) advanced a far broader account of speech in the individual and in society. Hyme's suggestions concerning an ethnography of speaking are well-grounded in de Laguna's work. Although she frankly admits adopting the method of behaviorism, de Laguna's theory rests far more on the results of introspection than observable facts. But in her chapter, "The Role of Speech in the Life of the Individual," she nonetheless impressively relates speech to still-current issues concerning perception and memory. Briefly, de Laguna's position is that the development

of speech, in society and the individual, contributes to the emergence of higher mental processes. In her words, "...speech marks the appearance of a new type of psychological organization. A higher level of integrating centers is added to the nervous system, making possible a vast extension in the range of human behavior" (p. 247).

The early insight of de Laguna is remarkably similar to Pavlov's speculation concerning the role of speech in the organization of higher mental processes (1941, p. 43):

> This supplement is the speech function, the last new principle in the activity of the cerebral hemispheres. If our sensations and concepts relating to the surrounding world are for us the primary signals of reality, the concrete signals--then the speech, chiefly the kinesthetic stimulations flowing into the cortex from the speech organs, are the secondary signals, the signals of signals. They represent in themselves abstractions of reality and permit of generalizations, which indeed makes up our special human mentality....

Pavlov's conception of the combined influence of vocal and verbal processes came to be known as the second signal system (Dance, 1967).

L. S. Vygotsky was the most influential of the early Soviet investigators of the "grandiose signal system of speech" (1962, p. 28). Apparently knowing nothing of de Laguna's work, Vygotsky provided quasi-experimental evidence and elaborated significantly on several important aspects of the cognitive function of speech. Chiefly, Vygotsky is known for his research on the role of speech in the child's cognitive development and his speculation on the nature and function of inner speech. Although Vygotsky's work is often difficult to interpret, and much of his evidence is anecdotal, he nonetheless intriguingly supports the notion that the

child's early speech behavior has vast consequences for his future cognitive development. Vygotsky described the child's speech development in four distinct stages. First, there is the "primitive or natural stage," in which the child possesses preintellectual speech and preverbal thought. Second, there is the "naive psychology" stage, wherein the child demonstrates the first signs of human intelligence, such as "the correct use of grammatical forms and structures before the child has understood the logical operations for which they stand" (p. 46). Third comes the "egocentric speech" stage, and this phase is characterized by "external signs, external operations that are used as aids in the solution of internal problems" (p. 47). The fourth and last stage was termed the "ingrowth stage," during which the child develops internalized speech.

Egocentric Speech, Vygotsky's third stage in the child's cognitive development, was first introduced by Piaget. However, Vygotsky took issue with Piaget's observation that egocentric speech serves no communicative function, and maintained that this speech, although seemingly directed at no one, serves a very important self-guiding function in the child's behavior. Vygotsky further stated that when children were observed in stress situations, "the coefficient of egocentric speech almost doubled" (p. 16). This speech for the child's own sake, then, was considered an external

manifestation of the developing inner processes, which when fully developed, assume the function of the externalized speech-for-self.

According to Vygotsky, inner speech differs from socialized or communicative speech in function as well as structure. Like egocentric or self-guiding speech, inner speech serves the individual; consequently, its structure is idiosyncratic:

> Inner speech is speech for oneself; external speech is for others. It would indeed be surprising if such a basic difference in function did not affect the structure of the two kinds of speech. Absence of vocalization per se is only a consequence of the specific nature of inner speech, which is neither an antecedent of external speech nor its reproduction in memory but is, in a sense, the opposite of external speech. The latter is the turning of thought into words, its materialization and objectification. With inner speech, the process is reversed: speech turns into inward thought. Consequently, their structures must differ. (P. 131)

Although Vygotsky was referring to some kind of internal verbal process, he offers no justification for calling such activity "inner speech." If it cannot be heard, and it differs in function and structure from social speech, why bother to label it speech at all? The question of what to call internal verbal responses is more than quibbling over semantics; it lies at the heart of Vygotsky's theory of the internalization of speech. Since Vygotsky did not provide us with an answer, we must postpone judgment on the efficacy of his terminology.

A. R. Luria, a contemporary of Vygotsky, conducted psychophysiological experiments on what he termed "self-regulatory" speech in children. In

his 1957 University of London lectures, Luria acknowledged the influence of Vygotsky on his theoretical position concerning the role of speech in human behavior (1961, p. 17):

> Having carefully observed the objects named by his mother, after he acquires the faculty of speech, the child begins to name them actively and thus to organize his acts of perception and his deliberate attention. When he does as his mother tells him he retains the traces of verbal instructions in his memory for a long time. Thus he learns how to formulate his own wishes and intentions independently, first in externalized and then in inner speech.

Like the preceding theorists, Luria believed in man's higher mental processes; further, he believed that these processes are "societally generated, structurally speech-borne and by nature volitional" (p. 35, italics his).

Luria went beyond his predecessors by empirically demonstrating a self-regulatory function of speech; i.e., the effects of speech on other behaviors. His experimental appartus consisted of a rubber bulb, held by the subject, attached to a potentiometric recorder which recorded the amount and duration of all hand-squeezing pressure. A display panel for the presentation of a stimulus light was also used. The light could be varied from a flash to several seconds duration, and it could also be presented in different colors. With this comparatively simple apparatus, Luria could require subjects to perform simple ("When you see the light flash, squeeze the bulb once.") or more complex ("When you see the red light, squeeze, but do not squeeze when you see the blue light.") tasks.

Luria's research has been described in detail elsewhere (Beiswenger, 1968; Wilder, 1969; Wozniak, in press). Briefly, Luria's theory is that the young child's behavior is initially diffuse or undifferentiated, and that his responses become more specific as a function of the development of his nervous system. As the nervous system develops, it becomes capable of reacting to and integrating various external and internal stimuli or signals to produce the specific response desired. Speech, the uniquely human signaling system, integrates these signals--first externally, and then internally--to produce verbal self-control or voluntary behavior. Luria's definition of voluntary behavior is "the accomplishment of simple action on the spoken request of an adult" (p. 51). While many signals (internal and external) aid the adult in the accomplishment of a simple action, the young child is incapable of responding to these signals. Consequently, Luria reported, children made unstable hand-squeeze responses to a flashing stimulus light, but the instruction to vocalize "Go" while squeezing the response bulb stabilized performance.

Current Research

It was suggested earlier that, since the early "laryngeating" theories, American researchers have tended to avoid the relationship between speech and cognition. Rather, they stress unobservable theoretical constructs like "language," "verbal processes," "mediation," and so on, which consider speech as simply the external manifestation of internal phenomena. Consequently, while the use of these theoretical constructs often leads to an experiment involving subjects who are requested to speak, such

speech is referred to as "labeling," "overt responding," "auxiliary activity," and so on. The speech response is comprised of all of these elements, and a complete analysis of the cognitive function of speech must take all these views into account. In this section the current research on the cognitive function of speech in children and adults is reviewed.

While Soviet researchers were actively exploring the regulatory and cognitive functions of speech, American theorists were more concerned with studies assessing children's cognitive abilities. In 1962, Hayne Reese summarized much of this research, and interpreted it as supporting a "mediational deficiency" hypothesis, which suggests that "there is a stage of development in which verbal responses do not serve as mediators" (1962, p. 502).

John Flavell first brought the Vygotsky-Luria viewpoint to bear on the mediational deficiency hypothesis. He pointed out that, in addition to the mediational deficiency hypothesis, it was possible to posit a "production deficiency." The production deficiency position is that although children may have the appropriate labels (concepts) necessary for mediation to occur, they may fail to produce these labels implicitly (i.e., silently). In a series of experiments wherein children overtly verbalized various aspects of the experimental task, Flavell found empirical support for the production deficiency hypothesis (Flavell, Beach & Chinsky, 1966; Daehler, Horowitz & Flavell, 1969).

In addition to studying the effects of overt verbalization on learning and memory, Flavell has also stimulated research on Luria's self-regulatory speech notions. However, he and his students have reported two failures

to confirm their Luria-derived hypotheses (Jarvis, 1968; Miller, Shelton, & Flavell, 1970). Independently of Flavell, I too found little support for the hypothesis that overt speech has a facilitative effect on the hand-squeeze response of the three-year-old child (1969). Wozniak has recently critically reviewed these attempted replications (in press), and he has challenged the negative findings on theoretical and methodological grounds. He also correctly noted that the Luria approach to self-regulatory speech cannot be interpreted from the American mediational viewpoint. While the theoretical and methodological controversy has yet to be resolved through experimentation, it appears that there is a considerable difference between self-regulatory and self-guiding speech. While the former is purely a function of the motor component of speech (i.e., the vocal component), self-guiding speech, while audible in the young child, is semantic in nature. Kohlberg and his students have provided an excellent overview of self-guiding or "private speech," and they have contributed data from a series of carefully controlled observational studies (Kohlberg, Yaeger, & Hjertholm, 1968). Briefly, they found that mental age and task difficulty were the major determinants in the occurrence of private speech in children. They also found support for Vygotsky's theory concerning the gradual internalization of such speech. Obviously, mental age makes considerable differences in one's perception of the difficulty of a task, which accounts for the sometimes facilitative effects of overt verbalization in adults as well as children. It would appear, then, that speech is useful in directing mental operations, and when these operations can be accomplished covertly, overt speech is no longer necessary.

With this developmental research in mind, let us focus on a general theory of the relationship between speech and cognitive processes. Since the cognitive approach is concerned with the human as an information processor, it is usually concerned with topics such as attention, perception, rehearsal, and memory. Within each of these topics, verbal processes usually are given special emphasis, since language is assumed to play a major role in the cognitive transformation of incoming stimuli. However, the cognitive consequence of speech gives us a unique perspective on human information processing.

Developmental theory leaves off and a general model of the cognitive function of speech begins with inner speech. However, it was suggested earlier in relation to Vygotsky that we have little justification for the use of such a term. Vygotsky's entire case for inner speech rested on "the genetic method of experimentation," which led him to hypothesize a genetic link between egocentric and inner speech (p. 132); consequently, most of his description of inner speech was based on the observation of egocentric speech. While Vygotsky's case is convincing, we still must ask what is left of external speech when it turns inward. Although inner speech probably can never be measured directly, current research does offer some indirect evidence relevant to this question.

Glanzer and Clark have hypothesized a "verbal loop" in human information processing (1964, p. 621):

> According to the hypothesis, an S carrying out a perceptual task translates the input-information into words, stores these words, and then uses them as the basis for his final response. The hypothesis implies that the extent of S's covert verbalization (or translation) for a given stimulus-object is critical in determining the efficiency of his performance.

They found support for the verbal loop hypothesis by correlating the

number of words taken to describe a stimulus (from written transcriptions) with accuracy in recall. As the number of words for a particular stimulus increased, accuracy in recall decreased. Cohen and Granström (1968) recently extended the hypothesis with respect to the complexity of the stimulus and the adequacy of the descriptions.

Krauss, Vivekananthan, and Weinheimer (1968) have conducted similar research on inner speech. In their experiment they asked a group of subjects to describe a number of color chips so that either they could later identify the chips (half of the subjects received these nonsocial encoding instructions) or that someone else could identify the chips from the descriptions (the other half received these social encoding instructions). Approximately two weeks later half of the nonsocial subjects received their descriptions to work with, while the other half of the subjects received someone else's instructions (they were tricked). Of the social encoding group, half of these subjects received someone else's description, while the other half received their own descriptions to work from (this latter group was also tricked). Their results indicated that:

> Accuracy in identifying colors was greatest for names which Ss themselves had supplied, intermediate for names given by others under social instructions, and least for names given by others under nonsocial instructions. Ss used their own color names with equal accuracy, regardless of whether the names had been given under social or nonsocial instructions. The nonsocial encoding condition produced more low-frequency (unusual) words than the social encoding condition; however, the number of words used by Ss in the 2 conditions did not differ significantly. (P. 295)

These results, combined with the verbal loop hypothesis, testify to the importance of language in information processing and to the idiosyncratic nature of inner speech. However, they have established only the verbal aspect of inner speech. Its acoustic aspects must also be confirmed.

In a series of investigations in which letters of the alphabet were presented rapidly, Conrad found that errors made by subjects in recalling the letters were acoustic errors, which suggests that what was stored in memory was related to the spoken representation of these letters (Conrad, 1962, 1963, 1964, 1965; Conrad & Hull, 1964). Further, Hintzman (1967) demonstrated that confusion errors for visually presented consonant-vowel-consonant nonsense syllables were more attributable to place of articulation than to voicing. Hintzman interpreted these results to support a kinesthetic feedback (from what he terms subvocal rehearsal) hypothesis. Still further, Locke has reported a number of investigations in which subvocal rehearsal was interpreted as a form of speech (Locke, 1970; Locke & Fehr, 1970).

It would appear that current research has demonstrated some form of speech-related internal activity during information processing. However, its precise nature and function have yet to be determined. Neisser has suggested that inner speech may be attention-compelling (1967, p. 215). Donald Norman (1969) has drawn interesting parallels between the act of speaking and the subvocal rehearsal of material to be learned. Further, the relationship between current concepts of inner speech and Vygotsky's early account is unclear. For example, Vygotsky conceived of writing as qualitatively different from speech (pp. 98-100), yet there appears to be considerable similarity between "private" writing (such as in the Krauss study) and Vygotsky's notion of the function of inner speech. Also, Vygotsky concluded that inner speech is "condensed, abbreviated speech" (p. 100); yet Krauss, et al. (1968) found no differences in the number of words used to describe the color chips between social and nonsocial encoders.

Studies of overt verbal behavior in adults are plentiful, but such speech behavior is seldom given attention in its own right. For example, Underwood, Jesse, and Ekstrand (1964) advanced a frequency theory of verbal discrimination learning which posits three types of responses in the learning of verbal discrimination lists: a representational response (RR), which occurs when the subject sees the two items he is to learn to discriminate; a pronouncing response (PR), which occurs when the subject chooses one of the items; and a rehearsal of the correct response (RCR), which presumably occurs when the subject sees which item was correct. The frequency theory is quite powerful in predicting performance in verbal learning experiments, but it says little about the processes involved in the RR, PR, and RCR. The PR is the most conspicuous in this respect, since it implies that pronouncing is important in learning.

Recently, a number of studies have examined the effects of various types of rehearsal instructions. The most relevant finding here is that spoken rehearsal was found to be superior to silent rehearsal in children (Carmean, 1969) and adults (Carmean & Wier, 1967; Wilder, 1971). O'Brien and Carmean (1967) compared the facilitative effects of spoken rehearsal of the correct response with instructions to write the correct response, and found no significant differences between these response modalities. They concluded that "it is the act of generating the name, irrespective of the modality in which it is expressed, which is crucial" (p. 336). Such a conclusion casts doubt on any theories which propose any unique cognitive effects associated with the speech response; consequently, this conclusion must be examined carefully.

Since the cognitive speech approach reviewed in this paper suggests that speech is internalized in the adult, we might presume that inner speech accompanies the written response. Consequently, before concluding that writing is an equally effective response modality, we must try, somehow, to eliminate the presumed inner speech. If we assume that writing entails the sequential production of letters (and inner speech integrates the internal response), then having subjects orally spell the correct response might inhibit internal response integration. Some evidence for the fact that oral spelling is inferior to covert performance exists (Reynolds, 1967), but this issue is far from settled. Other techniques for the examination and control of inner speech await discovery.

Most of the current research on overt speech involves having the subject say a single word rather than express an idea, since the single word approach is more amenable to experimental control. However, the examination of the cognitive effects of speaking in more complex experimental situations may prove to be an equally fruitful approach. For example, it has been reported that overt verbalization is superior to silent performance on a rather complicated problem solving task (Gagne & Smith, 1962) and that covert verbalization instructions were equally superior to silent performance with adult subjects (Wilder & Harvey, 1971). A developmental approach using problem solving paradigms might give more conclusive results concerning the covert verbalization abilities of younger children. Two difficulties are involved in such an approach. First, a task which allows for the comparison of performance at various ages must be found. Second, we must be able to determine whether the younger child understands the instructions to verbalize covertly

and cannot do it, or whether he simply cannot understand what is required of him.

In summary, it has been suggested that speech has a cognitive as well as a communicative function. From the cognitive viewpoint, speech is more than an external manifestation of thought and language. Speaking can often unite a thought and a word and produce meaning when it otherwise might not have occurred. In young children this is especially true, and during the course of human development, inner speech replaces external self-guiding speech.

This approach to the cognitive function of speech is far from complete. There is a great amount of literature which needs to be surveyed before a formal theory can be developed. At present the approach is too elastic; it expands and contracts to fit the results of divergent experiments. Also, much more research is needed to clarify various aspects of the approach, especially the development and nature of inner speech.

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II. SPEECH AS COMMUNICATION AND VERBAL BEHAVIOR

Language is a topic of major concern in many humanistic and scientific disciplines. Linguistics, rhetorical and communication theory, philosophy, and sociology are only a few of the fields contributing theory and research on various aspects of man's verbal behavior. While there are theories which explain everything from the learning of nonsense syllables to the acquisition of meaning, the act of speaking has been largely ignored by most theorists. Some view speech as social interaction or communication; others consider it a vehicle for transmitting language; still others see it as an historical event. While these viewpoints lead to broad theories concerning symbolic communication, they ignore the central role of speech in man's verbal behavior.

Carroll C. Arnold has examined the significance of "orality" in rhetorical theory, and he rightly points out that "It is not at all unusual to find otherwise careful philosophers and critics using variants of 'speak' as though the experiences of writing-reading and speaking-listening differed in no fundamental ways" (1968, p. 191). Theorists in communication and verbal behavior also ignore the modality of the symbolic response; consequently, we know far too little about speech behavior. The role of speech, in the individual and in society, is lost within lofty theories utilizing unobservable theoretical constructs and vague operational definitions.

Representative examples from the areas of communication and verbal behavior which ignore the spoken word are not difficult to find. In "Rhetorical Studies for the Contemporary World" (1971), Samuel L. Becker's major point seems to be that we need conceptual clarity concerning the parameters of communication, and that we generate testable hypotheses from phenomena of probable theoretical significance. In interpreting data on media usage by various types of audiences, however, Becker fails to note the high percentage within all groups surveyed that absorb news through speech communication. Lyle E. Bourne, in Human Conceptual Behavior, characterizes the development of verbal behavior as follows:

> . . . as a child matures his behavior is more and more influenced by self-generated stimuli. His own verbal behavior is the most important source of self-stimulation. Verbal responses, whether overt or implicit, mediate and regulate other overt behaviors. Words as symbols govern much of what we do. (Bourne, 1966, p. 22)

As in the Becker example, Bourne ignores the vocal aspect of verbal behavior. Speech is viewed simply as the overt expression of verbal responses which can occur covertly.

The foregoing examples are intended only to illustrate the general tendency to collapse across the specific modality of the symbolic response in theory building. According to these traditional views of communication and verbal behavior, the fact that man talks is, at best, phylogenetic serendipity. But speech may be viewed differently. We can consider it as uniquely human behavior which is fundamental to the process of human communication.

The distinction between language and the act of speaking it has never received enough theoretical attention. As long ago as 1927, Grace Andrus de Laguna noted:

> What is primarily needed for the successful study of the psychology of speech is a deliberate setting aside, if not an abandonment, of the metaphysical dualism which can conceive speech only as an external physical manifestation of inner psychical processes. What is needed is a fresh conception of speech as an essential activity of human life, fulfilling an indispensable function in the economy of life. (P. 19)

Speech scientist A. M. Liberman (1970) has recently elaborated on the necessity of research related to the vocal aspects of man's verbal behavior. He attributes considerable theoretical significance to the fact that speech is the only universal vehicle of language, and he points out that "no nonspeech acoustic alphabet has yet been contrived that can be made to work more than one-tenth as well as speech" (p. 306). Liberman's research suggests that man perceives speech quite differently than he does other sounds. According to this viewpoint, then, "speech is truly an integral part of language, not merely a convenient vehicle for transmitting it" (p. 304).

Soviet child psychologist L. S. Vygotsky (1962) contributed significantly toward an understanding of the role of speech in the development of verbal behavior. Vygotsky emphasized word meaning (an internal process) as the key to undertanding the relationship between thought and language. He attacked the problem of meaning developmentally, and his experiments with children at various ages led him to a theory of the internalization of speech during the course of human development. According to Vygotsky, meaning develops as the early speech communication experiences of the child are converted to inner speech, or silent dialogue-with-self. The theoretical and pedagogical implications of this internalization of speech model are discussed in Parts I and III. What needs to be stressed here is that the emphasis on the centrality of speech suggests qualitative differences between spoken and written communication. Vygotsky (1962) distinguished between these forms both

structurally and functionally. Writing was considered as "a second degree of symbolization," or "speech without an interlocutor" (p.99). Also, while oral speech developmentally precedes inner speech in Vygotsky's model, writing presumes its existence; i.e., it flows from inner speech.

Based on these considerations, it would seem that a theory of human communication would necessarily be a theory of speech communication. While general theories utilize analogies like telegraph keys (the sender and the receiver) connected by wire (the channel), human communication involves a unique code which is formed in a social context.

Centuries ago it was easy to see the centrality of speech to daily human activity. Currently, however, modern mass media are so conspicuous that we forget that man still communicates predominately by speaking, although the channels may vary. Serge Moscovici (1967) has recently reported sociolinguistic research on the specific effects of channels of communication:

> A message presupposes a code; transmitting it entails problems relating to the channel of communication. Striving to convince, causing to act, and instructing all imply considerable attention to the role a partner plays and to the result of interaction with partner. Language resumes the characteristics of a raw material when a speaker wants to do more than just convince or instruct; that is, when he adapts his speech to certain technical means, such as writing or the telephone, or to circumstances, like an examination or a legal debate, that involve strict ritual. The system of signals takes on a certain autonomy and demands specific structuring; the use of language is no longer relatively automatic, in particular when it is necessary to recode, translate, or pass from one channel of communication to another. Distribution of parts of speech and syntactic organization are determined by these channels. (P. 255)

While ancient rhetoricians postulated the effects of different situations upon the structure of a speech, modern speech communication theorists must account for the mass media. Also, verbal behavior theorists should be

aware of the relationship between overt and covert verbal processes. Until evolution erodes man's speech and introduces a faster and more efficient information transmitting system, it would seem that speech ought to be the fundamental unit of analysis in theories of human communication and verbal behavior. The variables studied within these disciplines are inextricably bound to the way man talks.

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III. SPEECH PROCESSES AND COGNITIVE LEARNING IN YOUNG CHILDREN

Traditionally, children's speech has been viewed from two different perspectives. "Oral language" implies a linguistic or psycholinguistic concern for the code upon which speech is based. "Oral communication" suggests an interest in the social function of speech; i.e., how the various components of the speech process affect behavioral changes. While these perspectives have yielded a considerable amount of useful information for the elementary school teacher, there is yet a third perspective which should be considered: the role of speech in the child's cognitive development. While oral language and communication theorists consider speech as simply a means of transmitting language, the cognitive development viewpoint considers children's speech as an integrator of thought and language. Thus, while older children and adults are capable of integrating thought and language covertly or silently (inner speech), young children often activate covert verbalization through overt self-instructions (self-guiding speech).

This paper presents a broad overview of research and theory regarding speech processes and cognitive learning in young children. First, the notion of "cognitive learning" is discussed. Second, several aspects of children's speech behavior are reviewed. Finally, the implications of speech and cognitive development for the elementary school teacher are examined.

Children's Cognitive Learning

Cognitive learning is usually meant to imply higher-order learning, rather than the simple combination of stimulus, response, and reinforcement Theorists concerned with cognitive learning presume that humans are indeed capable of thinking, and what is more, humans prefer organized learning situations to rote learning. As students, we have all experienced the struggle to relate material to be learned to something else or to devise some intricate mnemonic. As teachers, we have witnessed students for whom we have failed to make things "click."

This "click" or "ah ha!" in human thinking underscores the meaning of cognitive learning: the imposition of a structure or a conceptual strategy upon a learning situation; some internal event which intervenes between the stimulus and the response. More often than not, however, we are not even aware of these internal events. We do it implicitly or automatically. Consider, for example, a simple discrimination task: you are told that you will be presented with two circles (one large, one small), and there is money beneath one of them. You find the money under the large one, and after a few trials you establish that the money will always be under the large circle. Just at the point when you begin reaping the harvest of your learning, however, the game changes. The large circle you were consistently choosing is paired with a larger circle, and you are told there is a very large sum of money beneath one of the circles but you only get one choice. You could choose the same circle you had before, or you could choose the same relationship you had before ("bigger than"). Obviously, the odds are equal for whichever circle

you choose. Experiments like this have demonstrated that young children tend to choose the same circle they had before, while older children and adults tend to choose the "larger than" circle.

Language appears to account for this difference in performance. Younger children learned to discriminate the specific circle the reward was under, while older children, in addition to learning to discriminate the circle, also learned the relationship. Presumably, covert verbal responses accompany older children's learning, while no such responses occur in younger children. Bourne (1966) has characterized this development of verbal behavior in the following manner:

> . . . as a child matures his behavior is more and more influenced by self-generated stimuli. His own verbal behavior is the most important source of self-stimulation. Verbal responses, whether overt or implicit, mediate and regulate other overt behaviors. Words as symbols govern much of what we do. (P. 22)

According to Bourne, language is an internal mediator of behavior; verbal responses may be overt or covert. From this traditional viewpoint, speech is assumed to be simply the overt expression of language (this assumption will be questioned later).

A considerable amount of research like the circle game has demonstrated age differences in the ability to use concepts or verbal labels to aid or mediate performance (Wilder, 1969). Previously, it was thought that younger children (under 7) were "mediationally deficient" (Reese, 1962). Thus while the young child possesses the verbal label "big" and "small," these labels fail to function as cognitive aids during the circle game.

Recently it has been argued that there are two issues involved in

the mediational deficiency hypothesis. Does the child actually produce the label during the experimental game and it fails to function or does the young child tend not to produce the label in the first place? The second possibility was termed a "production deficiency" (Flavell, Beach and Chinsky, 1966). Research on production deficiencies in young children indicates that if young children are requested to overtly produce the verbal labels while performing the experimental game, performance is comparable to older children doing the same task silently. Children's speech, then, appears to be an integral part of their cognitive behavior, while older children and adults can covertly produce verbal responses which mediate performance. In older children, overt speech has internalized, and covert or inner speech has now taken over the mediational role of overt speech.

Children's Speech Behavior

As any elementary school teacher can testify, there is a considerable amount of verbal activity in the classroom. Young children tend to spontaneously verbalize in learning and play situations. Jean Piaget (1952), in his early observations of young children's speech behavior, noted that many of their utterances were not directed to anyone. Consequently, Piaget termed this non-communicative speech "egocentric," and he viewed egocentric speech as a reflection of the child's cognitive immaturity.

L. S. Vygotsky, a contemporary of Piaget's, was independently studying children's speech in the Soviet Union, and he maintained that egocentric speech is not intended to communicate; rather, it serves a self-guiding function. One of Vygotsky's narrative accounts vividly depicts this self-guiding function of egocentric speech:

> A child of five and a half was drawing a streetcar when the point of his pencil broke. He tried, nevertheless, to finish the circle of a wheel, pressing down very hard but nothing showed on the paper except a deep colorless line. The child muttered to himself, "It's broken," put aside the pencil, took watercolors instead, and began drawing a broken streetcar after an accident, continuing to talk to himself from time to time about the change in his picture. The child's accidentally provoked egocentric utterance so manifestly affected his activity that it is impossible to mistake it for a mere by-product, an accompaniment not interfering with the melody. (1962, p. 17)

Piaget and Vygotsky were directly opposed concerning the fate of egocentric speech as well as its function. While Piaget maintained that it dies off and is replaced by <u>socialized</u> speech, Vygotsky maintained that egocentric speech internalized rather than dying off, and <u>inner speech</u> replaces egocentric speech.

More recent research has clarified the course of egocentric speech development. Kohlberg, Yaeger, and Hjertholm (1968), in a series of carefully planned and controlled observations, have noted a considerable amount of such speech between the ages of four and seven, and spontaneous speech disappears somewhere between the ages of seven and ten. Further, these investigators noted variations in egocentric speech as a function of IQ and task difficulty as well as chronological age. A developmental hierarchy of seven types of "private speech" was proposed: Category 1, word play and repetition: Category 2, remarks to nonhuman objects; Category 3, describing own activity; Category 4, questions and answers by the self; Category 5, self-guiding comments; Category 6, inaudible muttering; Category 7, silent inner speech (p. 732).

It may be concluded from recent research that there are many types of private speech. Indeed,some utterences seem to serve no communicative or cognitive function (egocentric), while others appear to be self-guiding. These conclusions are drawn from observations recorded in free play and adult-structured situations. Still stronger support for the self-guiding function of speech comes from experiments with children and adults, wherein speech behavior is elicited to facilitate learning (see Part I, also Wilder, 1969, 1971; Wilder and Harvey, 1971). Such research suggests that age and task complexity contribute to the need for self-guiding speech.

Speech and the Elementary School Classroom

Research on speech processes and cognitive learning strongly questions the assumption that language is the essential mediator of behavior, and that speech is simply an overt verbal response that could occur covertly. In young children especially, speech is more than "oral language." which presumes stable internal verbal prosesses; rather, the young child's speech shapes his developing internal verbal responses. Nor is the young child's speech simply oral communication of what he is thinking. Only older children and adults are capable of silent self-dialogue, or directed thinking. Just as speech shapes covert language processes, it is also an overt rehearsal of the directed thinking abilities he will later do silently.

Oral language programs should be more than structured attempts to teach the child how to communicate like an adult. Understanding the stages of private speech development should lead to the establishment of programs which in part are concerned with how children are trained to talk to themselves. The following represents one of the few references in the speech and language education literature to the cognitive utility of private speech:

> Our conclusion was that self-talk has a real utility. It serves as the vehicle for teaching the child to think. Perhaps the child knows what all the educators have forgotten--that it is possible to learn to think, and that the initial step in acquiring this facility is through self-talk. By associating verbal symbols with all the features of his experience he gains the ability to use that experience in the future. He can remember it more easily; he can fit it into new patterns . . . .

> Little children know instinctively that thought must be fluent to be effective. They know that autistic speech is the one basic invention which gives them mastery of the future. It is the peculiarly human gift. Having just mastered the use of this magical tool, small children are busy using it. They express what they see; they say what they do; they tell what they feel. They are trying hard to learn how to talk to themselves fluently. (Van Riper and Butler, 1955, pp. 115-116)

Sensitivity to the cognitive functions of private speech leads the teacher to different behavioral objectives than does sensitivity to speech communication. While speech communication is more systematic and commonly practiced among children, private speech is more idiosyncratic; consequently, concern for private speech development leads to the concept of a child centered, teacher-as-facilitator classroom. Learning is considered to be more than the transmission of knowledge from the teacher to the child. Rather, the child must learn to represent that knowledge for himself, in his own words. Consequently, active speech behavior should be encouraged in the lower elementary school learning situations.

At about the third grade, the child should be internalizing private speech. Procedures utilizing speech in "cognitive training" experiments have been reported (Meichenbaum, 1971). The self-instructional training procedures involve: (1) teacher performs task and talks to child, (2) child performs task while teacher talks, (3) child performs task and talks to himself, (4) child performs the task silently. The following represents an example of the speech training given to kindergarten children:

> "Okay, what is it I have to do? You want me to copy the picture with the different lines. I have to go slow and be careful. Okay, draw the line down, down, good; then to

> the left. Good, I'm doing fine so far. Remember, go slow. Now back up again. No, I was supposed to go down. That's okay. Just erase the line carefully. . . . Good. Even if I make an error I can go on slowly and carefully. Okay, I have to go down now. Finished. I did it." (Meichenbaum, 1971, p. 8)

Teaching strategies based on private speech and the development of inner speech can help the child to communicate with and understand himself, which must precede his understanding of and communication with others.

In conclusion, it should be noted that little is known about individual differences and the development of inner speech. We do not know whether each child passes through the developmental hierarchy of overt to covert verbal behavior. We do know that some children talk considerably and others seem to absorb information silently. Such silent children should not be encouraged to change their learning style, just as the talkative child should not be inhibited when possible.

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